

NEW SPECIES, VARIETIES, AND COMBINATIONS IN *BIDENS* SECTION
GREENMANIA (ASTERACEAE: COREOPSIDEAE)

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ABSTRACT

As a result of systematic studies of *Bidens* section *Greenmania* in México, Central America, and Jamaica, the following new taxa and nomenclatural combinations are proposed: two new species, *Bidens izabalensis* sp. nov., and *Bidens boquetiensis* sp. nov.; four new varieties, *Bidens antiguensis* Coulter var. *salvadorensis* var. nov., *Bidens squarrosa* H.B.K. var. *atrostriata* var. nov., *Bidens squarrosa* var. *speciosa* var. nov., and *Bidens squarrosa* var. *hondurensis* var. nov.; and three new varietal combinations, *Bidens antiguensis* var. *procumbens* comb. nov., *Bidens squarrosa* var. *tereticaulis* comb. nov., and *Bidens squarrosa* var. *indivisa* comb. nov. When appropriate, keys to the taxa are provided.

KEY WORDS: Asteraceae, Coreopsidae, *Bidens*, systematics, México, Central America.

A recent systematic study of *Bidens* section *Greenmania* in México, Central America, and Jamaica has resulted in a substantial revision of the section (Roseman 1986). It is now necessary to present the new species and varietal descriptions and new nomenclatural combinations so that they may be used in the treatment of *Bidens* for the Asteraceae of México (Turner & Nesom, in prep). Details of the morphological, phenetic, flavonoid and cytological data that formed the basis of the revision will be published later.

***Bidens antiguensis* Coulter var. *procumbens* (Donn. Smith) Roseman, comb. nov.** BASIONYM: *Bidens coreopsidis* DC. var. *procumbens* Donn. Smith, Bot. Gaz. (Crawfordsville) 42:299. 1906. TYPE: GUATEMALA. Alta Verapaz: Near Secanquim, 550 m, Jan 1905, *Maxon & Hay 3162* (HOLOTYPE: US!; Isotype: GH!).

REPRESENTATIVE SPECIMENS: GUATEMALA. Alta Verapaz: *Steyermark 44239*, lowland forest in valley, "pantano," 2.5 mi W of Cubilquitz, 250-300 m, 28 Feb 1942 (F). Petén: *Aguilar 214*, La Liberstad and vicinity, 5 Jan 1935 (AAH, F, MICH, MO); *Contreras 3360*, Lacandon, on El Caribae trail, ca. 800 m, 8 Feb 1962 (LL); *Contreras 3113*, Polores, in pineland, km 81 of road, 27 Oct 1961 (LL). Zacapa: *Roseman 594*, 9 mi N of Zacapa-Izabal boundary, on road from El Progreso to Puerto Barrios, 100-500 m, 1 Jan 1980 (IA); *Roseman 597*, near Juan de Paz, on road from El Progreso to Puerto Barrios, 3 mi from Zacapa-Izabal boundary, on road from El Progreso to Puerto Barrios, 100-500 m, 1 Jan 1980 (IA).

MÉXICO. Chiapas: *Martínez S. 10440*, en campamento Cofolasa a 24 km al SE de Crucero Corozal, camino a Boca Lacantum, Mpio. Ococingo, 220 m, 14 Feb 1985 (TEX).

Sherff (1955) listed both *Bidens coreopsidis* DC. var. *procumbens* Donn. Smith and *B. antiquensis* Coulter as synonyms of *B. squarrosa* H.B.K. However, the widespread *B. squarrosa* is almost entirely hexaploid, $n=36$, while both *B. coreopsidis* var. *procumbens* and *B. antiquensis* are tetraploid, $n=24$. In contrast to the hexaploids, populations of *B. antiquensis* have small, mostly smooth awned achenes, shorter leaves with narrower segments, ray florets with fewer striations, and shorter disc florets and anthers.

The var. *procumbens* differs from var. *antiquensis* in having sparsely barbed awns rather than smooth awns, mainly 5 parted rather than 3 parted leaves, with narrower leaflets, and a twining stem with particularly long internodes. Sherff (1955) noted the similarity of *B. c.* var. *procumbens* to *Bidens reptans* (L.) G. Don, a diploid ($n=12$) species, located primarily in Jamaica. *Bidens antiquensis* var. *procumbens* may be readily distinguished from *B. reptans* by its longer leaves (11.0-12.5 cm long vs. 7.5-10.0 cm), narrower rays (2.8-3.5 mm wide vs. 4.0-4.5 mm), shorter achenes (4.8-7.2 mm long vs. 8.4-10.8 mm), and fewer outer involucre bracts (6-8 vs. 7-11).

Bidens antiquensis Coulter var. *salvadorensis* Roseman. var. nov. TYPE: GUATEMALA. Jutiapa: 4.6 mi W of Jutiapa, 700-1000 m, 16 Nov 1979, *Roseman 531* (HOLOTYPE: IA!; Isotypes: to be distributed).

B. antiquensi Coulter multum similis sed differt floribus radii carentibus vel raro 1-4 atque 7.5-11.0 mm longis, involucre bracteis exterioribus plerumque minus quam 0.6 mm latis, et aristis pappi laevibus vel raro 1-4 hamulis retrorsis munitis. Numerus chromosomatum $n=24$.

REPRESENTATIVE SPECIMENS: EL SALVADOR. Ahuachapán: *Stanley 20220*, vicinity of Ahuachapán, 800-1000 m, 9-27 Jan 1922 (GH, NY, US). La Libertad: *Carlson 247*, road between Finca Germania and Finca San Antonio, near Comasagua, ca. 900 m, 23 Jan 1946 (F). Morazan: *Tucker 597*, N

slope of hill north of Montecristo (ca. 15 km NE of San Miguel), 13° 36' N. 88° 04' W, ca. 200 m, 20 Dec 1941 (F, NY, US). San Salvador: *Calderon* 169, San Salvador, 1921 (GH, NY, US). Sonsonate: *Standley* 21844, in hedge, vicinity of Izalco, 19-24 Mar 1922 (GH, US).

GUATEMALA. Esquintla: *Smith* 2375, San Luis, 1000 ft, Apr 1890 (US). Jutiapa: *Roseman* 573, 12.3 mi SE of Zunil on road from Retalhuleu to Quetzaltenango, 500-700 m. 23 Dec 1979 (IA). Retalhuleu: *Standley* 88582, dry thicket, vicinity of Retalhuleu, 240 m, 17 Feb-1 Mar 1941 (F). Santa Rosa: *Heyde & Lux* 4193, Buena Vista, 550 m, Dec 1892 (F, GH, MO, NY, US). Suchitepequez: *Standley* 62168, damp thicket, near Patulul, 330-600 m, 5 Jan 1939 (F, GH, NY).

HONDURAS. Choluteca: *Williams & Molina* 10895, vine in tree in pine forest near San Marcos, 1000 m, 16 Nov 1946 (F, GH, US). Cortez: *Carleton* 443, Cuyamel, 19 Jan 1923 (US). El Paraíso: *Molina* 655, in oak forest below Guayabillas near Quebrada Jagua, 1050 m. 12 Dec 1947 (F, GH, US). Morazan: *Williams & Molina* 10826, barranca near Las Mesas, 900 m, 23 Nov 1926 (F).

NICARAGUA. Estelí: *Stevens & Grijalva* 15664, Loma Ocotecalzado (Mesas Moropotente), ca. 11 km NE of Hwy 1 at Estelí, 1260-1300 m, 15 Nov 1979 (TEX). León: *Baker* 2121, Quesalguague, 17 Jan 1903 (TEX). Matagalpa: *Zelaya* 1805, Matagalpa, 6 Jan 1969 (F, GH, MO, NY); *Williams, Molina & Williams* 23744, cloud forest area ca. 5 km N of Matagalpa, Cordillera Central de Nicaragua, 1000 m, 13 Jan 1963 (F, NY, US).

The congested cymose capitulescence and usually discoid heads of var. *salvadorensis* distinguish it from the showier, larger headed var. *antiguensis*. Var. *salvadorensis* occurs along the Pacific slopes in Guatemala and further SE in Central America, whereas var. *antiguensis* occurs in the highlands of Guatemala and Chiapas. Var. *procumbens* is restricted to lower elevations with drainages to the Gulf of Mexico or the Gulf of Honduras. The varieties of *Bidens antiguensis* may be identified by the characters given in the following key.

KEY TO VARIETIES OF *BIDENS ANTIGUENSIS*

1. Leaves mainly 3 parted. blade segments 2.2-3.5 cm wide; achene awns smooth 2
- 1' Leaves mainly 5-7 parted. blade segments 1.5-2.1 cm wide; achene awns with 1-6 retrorse barbs and 0-2 antrorse barbs var. *procumbens*
2. Heads 6-9 mm wide, eradiate or with 1-4 rays, these 7.5-11.0 mm long; outer involucre bracts 3.5-4.5 mm long and 0.4-0.6 mm wide;

SW Guatemala, El Salvador, Honduras, and

Nicaragua var. *salvadorensis*

2' Heads 20-30 mm wide, radiate with 4-5 rays, these 10.3-15.0 mm long; outer involucre bracts 3-4 mm long and 0.5-1.3 mm wide; central Guatemala var. *antiguensis*

***Bidens squarrosa* H.B.K. var. *atrostriata* Roseman, var. nov. TYPE: MÉXICO. Oaxaca: Monte Alban, hillside behind grand court, 1500-2000 m, 11 Nov 1979, *Roseman 518* (HOLOTYPE: IA!; Isotypes: to be distributed).**

B. squarrosae H.B.K. var. *squarrosae* similis sed differt capitulis majoribus (2.3-2.6 cm vs. 2.0-2.3 cm latis), floribus radii longioribus (14-16 mm vs. 12-13 mm longis), et ligulis sulphureis sed pallidis vs. fuscatis.

Leaves 3 parted, (5.8)6.2-14.0(17.8) cm long, (3.9)4.2-10.6(14.0) cm wide, glabrous to densely tomentose, leaflets ovate lanceolate to lanceolate, acuminate; peduncles (1.2)1.4-4.1(4.6) cm long; capitula (2.0)2.3-3.6(4.1) cm wide; outer involucre bracts 5-9(12), these 4.1-6.3(8.0) mm long, 0.6-1.2(1.8) mm wide, densely tomentose on both surfaces; inner involucre bracts 4.1-6.3(8.0) mm long, 1.0-1.4(1.6) mm wide, usually dark brown striped, moderately to densely tomentose; ray florets 5-7(8); ligules 1.2-1.8(2.1) cm long, (3.5)4.0-6.0(7.5) mm wide, pale lemon yellow with dark striations (when dried); disc florets 5.3-6.9(8.2) mm long; anther tubes golden brown, 3.2-4.0 mm long; chromosome number $n=36$ or (rarely) $n=24$.

REPRESENTATIVE SPECIMENS: MÉXICO. Chiapas: *Breedlove & Thorne 30442*, Steep ravine adjacent to Mexican Hwy 190, 20 km W of Cozoacoatlá, 1000 m, 22 Dec 1972 (LL). Guerrero: *Martínez S., et al. 4979*, 2 km al SW de Cruz de Ocote, Camino Filo de Caballo-Puerto de Gallo, 1900 m, 18 Oct 1983 (TEX). Jalisco: *McVaugh 15980*, volcanic slopes 14-15 mi by rd. N of Autlán de Navarro, 3800-4100 ft. 27 Oct 1970 (LL). Michoacán: *Cronquist 9732*, 12 mi S of Ario de Rosales, 4500 ft, 25 Oct 1962 (GH, MICH, MO, US); *King & Soderstrom 4880*, ca. 22 kms S of Uruapan, 3300-3700 ft, 16-22 Oct 1961 (MICH, NY, US); *Roseman 514*, ca. 20 mi S of Arteaga, 1000-1500 m. 7 Nov 1979 (IA). Oaxaca: *Melchert 71-163*, ca. 40 mi S of Totolapán, just SE of Lajarcia, on Hwy 190, ca. 800 m, 18 Oct 1971 (IA); *Roseman 519*, 46-47 mi SE of Oaxaca, just N of Totolapán, 800-1600 m, 11 Nov 1979 (IA); *Cronquist 9685*, savanna-land hillsides just below the pine zone, along the Pan-American highway, 42 mi NW of Tehuantepec, ca. 2300 ft, 17 Oct 1962 (GH, MICH, MO, MSC, NY, US).

The most striking feature of var. *atrostriata* is the pale sulfur yellow color of its ligules, contrasting with the darker sulfur yellow of other *Bidens squarrosa* varieties. When dried, the ligules of var. *atrostriata* become pale with very

dark striations. the inner involucre bracts have dark brown to black striations, and the anthers are golden to light brown. Var. *atrostriata* can also be distinguished from varieties *tereticaulis*, *hondurensis*, and *squarrosa* by its much larger capitula (29.5 ± 1.4 mm wide) and longer rays (14.9 ± 0.7 mm long). Var. *speciosa* has even larger heads; however, var. *atrostriata* has more numerous ray florets (6.3 ± 0.3) and longer anther tubes (3.6 ± 0.1 mm).

***Bidens squarrosa* H.B.K. var. *speciosa* Roseman var. nov.** TYPE: GUATEMALA. Quetzaltenango: 1 mi from Zunil on road to Fuentes Georgina, ca. 2500 m, 24 Dec 1979, *Roseman 583* (HOLOTYPE: IA!; Isotypes: to be distributed).

B. squarrosae H.B.K. var. *atrostriatae* Roseman similis sed floribus radii longioribus (17-18 mm vs. 14-16 mm longis) ligulis atrosulphureis et involucri ciliis longis ad margines atque bases bractearum strigosarum externarum.

Leaves usually 5 parted, (7.6)10.0-15.2(17.2) cm long, (4.8)6.4-12.6(14.2) cm wide, leaf segments (1.9)2.3-3.9(4.7) cm wide; peduncles 2.6-4.3 cm long; capitula 2.6-3.8(4.2) cm wide; outer involucre bracts (5)6-8(9), these 3.8-6.2(8.0) mm long, 0.8-1.4(1.8) mm wide, long strigose on both surfaces, long ciliate margins; inner involucre bracts 5.7-7.1(7.5) mm long, 1.3-1.9 mm wide, usually containing purple anthocyanins. yellow tomentose apically: ligules (1.3)1.5-2.0(2.4) cm long, 4.4-5.8(6.2) mm wide: disc florets 5.4-7.0(7.5) mm long; anther tubes 2.7-3.7 mm long; chromosome number, $n=36$.

REPRESENTATIVE SPECIMENS: GUATEMALA. Chimaltenango: *Skutch 763*, near Tecpam, 7200 ft, 16 Dec 1933 (AAH, MICH, US). Huehuetenango: *Steyermark 48839*, vicinity of Moxbal, ca. 17 mi N of Barillas, Sierra de los Cuchumatanes, 1500 m, 15-16 Jul 1942 (F, US). Quetzaltenango: *Roseman 574*, just past village of Santa María de Jesús on road to Quetzaltenango, 2000-2500 m, 23 Dec 1979 (IA). Quiché: *Skutch 1816*. "Zona Reyna." 2600 ft. 2 Dec 1934 (AAH). Sacatepequez: *Kellerman* (US 2442545), Antigua, Volcán de Agua, 15 Feb 1905 (US). Solola: *Kellerman 7474*, San Lucas Toliman, Atitlán, 7000 ft, 23 Jan 1907 (US). Zacapa: *Steyermark 42580*, slopes of Monte Virgen, 2200-2400 m. 12-13 Jan 1942 (F, NY).

MÉXICO. San Luis Potosí: *Pringle 3373*, Tamosopo Canyon, 28 Nov 1890 (F, GH, MO, MSC, NY, RSA, US). Tamaulipas: *Viereck 944*, San Lucas, 800 m. (without date) (US). Veracruz: *Roseman 631*, Cascades de Naolinca, 1000-1500 m, 23 Jan 1980 (IA); *Roseman 629*, 10 mi S of Huatusco, 1500-2000 m, 21 Jan 1980 (IA).

Var. *speciosa* occurs primarily in the mountains of Guatemala. and also on volcanic peaks of central and southern México. It has the longest peduncles (37.0 ± 2.3 mm), widest capitula (33.9 ± 1.0 mm) and longest ray florets

(17.7 ± 0.5 mm) of any variety within *Bidens squarrosa*. It has large, often 5 partite leaves, with deep, forward pointing serrations and long ciliate margins. Both inner and outer involucral bracts are strigose, and the outer bracts have long ciliate margins and bases.

Bidens squarrosa* H.B.K. var. *tereticaulis* (DC.) Roseman, *comb. nov.
 BASIONYM: *Bidens tereticaulis* DC., *Prodr.* 5:598. 1836. LECTO-TYPE (here designated): MÉXICO. Veracruz: in silvus, Tantoyuca, Dec 1830, *Berlandier 2150* (G-DC; Isolectotypes: F!, GH!, MO!).

REPRESENTATIVE SPECIMENS: BELIZE: *Proctor 29365*, wooded limestone hillside, Los Altos Hill, Augustine, 1500-1600 ft, 3 Dec 1968 (LL); *Lundell 136*, Honey Camp, Orange Walk, Sep-Dec 1928 (F, GH, US).

MÉXICO. Campeche: *Lundell 1032*, Tuxpena, Dec 8, 1931 (F, MICH, MO, NY, US). Chiapas: *Breedlove 7687*, slopes along the Tana Te' river near Sahal K'esh, paraje of Mahben Chauk, 2900 ft, 27 Nov 1964; *Breedlove 41895*, 15 km E of La Trinitaria on rd. to Monte Bello, 1600 m, 28 Nov 1976 (LL); *Breedlove 41480*, rd. from Tuxtla Gutiérrez to Chicoasen Dam, 850 m, 17 Nov 1976 (TEX); *Roseman 523*, single vine 25 ft high in a tree, ca. 30 mi SE of San Cristóbal de las Casas, 1600-2400 m, 13 Nov 1979 (TEX). Hidalgo: *Roseman 634*, ca. 12 mi S of Huehutla, 28 Jan 1980 (IA). Oaxaca: *Roseman 619*, sprawling over wet ground, ca. 8 mi N of Chiltepec, 200-400 m, 17 Jan 1980 (IA). Puebla: *Goldman 30*, near Metaltoyuca, 800 ft, 27 Jan 1898 (GH, MICH, US). San Luis Potosí: *Frye & Frye 2958*, S of Valles, near Río Tampacon, 31 Dec 1940 (F, GH); *Roseman 639*, growing along cliffs 3-4 mi N of Tamazunchale. 400-800 m, 30 Jan 1980 (IA). Tabasco: *Rovirosa 688*, in thickets between San Juan Bautista and Atasta, 8 Jan 1890 (NY, US). Tamaulipas: *Palmer 122*, vicinity of Tampico, ca. 15 m. 1-31 Jan 1910 (F, GH, MO, NY, US). Veracruz: *Smith 587*, Coatzacoalcos. Isthmus of Tehuantepec, 5 Feb 1895 (GH, MICH, MO, NY, US); *Roseman 637*, near Tampico, 0-100 m, 29 Jan 1980 (IA). Yucatán: *Roseman 612*, ruins at Uxmal, 0-100 m, 14 Jan 1980 (IA); *Greenman 468*, Izamal. 22 Feb 1906 (F).

Var. *tereticaulis* occurs along the Gulf slopes in E México. in the Yucatán Peninsula, and also in Chiapas. Several distinctive flavonoid populational groupings have been found within var. *tereticaulis* (Roseman 1986). It can be distinguished from other varieties of *Bidens squarrosa* by means of the characters listed in the following key.

KEY TO VARIETIES OF *BIDENS SQUARROSA*

1. Heads usually larger than 25 mm, ray number usually 5 or more, ray length greater than 14 mm, ray width greater than 4.5 mm, disc floret length greater than 5.5 mm2

- 1' Heads usually smaller than 25 mm, ray number zero to 4 (or rarely 5), ray length less than 14 mm, ray width less than 4.5 mm, disc floret length less than 5.5 mm 3
2. Peduncles longer than 32 mm, achenes shorter than 10.5 mm, awns usually with less than 5 retrorse barbs, rays and inner involucre bracts with brown or golden striations (when dried), anthers dark brown or purplish var. *speciosa*
- 2' Peduncles shorter than 32 mm, achenes longer than 10.5 mm, awns usually with more than 5 retrorse barbs; rays and especially inner involucre bracts with dark brown to blackish striations (when dried), anthers golden to light brown var. *atrostriata*
3. Achenes usually longer than 9.5 mm, awns usually shorter than 3.4 mm; plants of México and Belize var. *tereticaulis*
- 3' Achenes usually shorter than 9.5 mm, awns usually longer than 3.4 mm; plants of Central and South America 4
4. Heads usually 17-20 mm across, the ligules mostly shorter than 11 mm, striations of ligule usually 10 or more, leaves mostly simple, these glabrous to sparsely hispidulous (never tomentose), plants of Nicaragua var. *indivisa*
- 4' Heads usually 20-26 mm across, the ligules mostly longer than 11 mm; striations of ligule usually 8-9, leaves simple or 3-5 parted, variously glabrous to tomentose; plants of Honduras, El Salvador, Costa Rica, Panamá, and South America 5
5. Leaves simple and tomentose, outer involucre bracts usually shorter than 4 mm, inner involucre bracts usually shorter than 5.5 mm; plants of Honduras, El Salvador, and northern Costa Rica var. *hondurensis*
- 5' Leaves usually 3 parted, sometimes simple or 5 parted, glabrous to moderately pubescent, outer involucre bracts usually longer than 4 mm, inner involucre bracts usually longer than 5.5 mm; plants of Costa Rica, Panamá, and South America var. *squarrosa*

Bidens squarrosa H.B.K. var. *hondurensis* Roseman, var. nov. TYPE: HONDURAS. Morazan: over shrubs in bog, San Juan del Rancho, slopes of Mt. Uyuca, 1500 m, 12 Dec 1975, L.O. Williams & Antonio Molina R. M-10 (HOLOTYPE: IA!; Isotype: EAP). The types cited here are part of a group of specimens sent by L.O. Williams to T. Melchert for cytological and flavonoid studies.

B. squarrosae H.B.K. var. *squarrosae* similis sed differt foliis parvis simplicibus dense tomentosisque, pedunculis brevioribus (23-27 mm vs. 30-33 mm longis), et involucri bracteis interioribus brevioribus (4.8-5.2 mm vs. 5.6-5.8 mm longis).

Leaves simple, (3.5)7.3-11.3(13.7) cm long, 2.2-3.0 cm wide, moderately to densely tomentose; peduncles 1.8-3.1 cm long, capitula (0.9)1.7-3.1(3.4) cm wide; outer involucre bracts 2.6-4.8 mm long; inner involucre bracts (3.0)4.2-5.6(6.0) mm long; chromosome number $n=36$.

REPRESENTATIVE SPECIMENS: COSTA RICA. Puntarenas: *Roseman* 570, ca. 6 mi S of Santa Elena, 21 Dec 1979 (IA).

HONDURAS. Comayagua: *Standley* 56430, vicinity of Siguatepeque, 1080-1400 m, 14-27 Feb 1928 (F, US). Copán: *Pittier* 1838, in hedges around Copán, 600 m, 9 Jan 1907 (F, US). El Paraíso: *Williams & Molina* M-11, Ojo de Agua, Choluteca river valley, 650 m, 11 Jan 1976 (EAP, IA). La Paz: *Williams & Molina* M-3, Hoya Grande, above Escuela Agrícola Panamericana, 1200 m, 18 Dec 1975 (EAP, IA). Olancho: *Standley* 18288, trail from Catacamas, 500-900 m, 19 Mar 1949 (F).

This variety is widespread in Honduras, and is found also near the crater of Volcán San Salvador in El Salvador, and at scattered localities south into northwestern Costa Rica. The plants are commonly simple leaved and densely tomentose throughout, with small capitula (23.9 ± 1.5 mm across), short peduncles (24.5 ± 1.6 mm), and particularly short inner involucre bracts (5.0 ± 0.2 mm long). Although the small heads are quite similar to those of var. *tereticaulis*, the small, tomentose, simple leaves of var. *hondurensis* are in marked contrast to the large 3-5 partite, usually glabrous or slightly pubescent leaves of var. *tereticaulis*. The short peduncles of var. *hondurensis* distinguish it from var. *squarrosa*.

Bidens squarrosa H.B.K. var. *indivisa* (B.L. Robins.) Roseman, *comb. nov.* BASIONYM: *Bidens tereticaulis* DC. var. *indivisa* B.L. Robins.. Proc. Bost. Soc. Nat. Hist. 31:270. 1904. TYPE: NICARAGUA. Masaya: Masaya, 27 Jan 1903, *Baker* 2214 (HOLOTYPE: GH!; Iso-types: GH!, MICH!, MO!, NY!, POM!, US!).

REPRESENTATIVE SPECIMENS: HONDURAS. Yoro: *Standley* 55075, near Progreso, 30 m, 24 Jan 1928 (F, US).

NICARAGUA. Managua: *Standley* 8229, vicinity of Casa Colorado near El Crucero, summit of Sierra de Managua, 800-900 m, 14-15 May 1947 (F); *Grant* 1003. Sierras de Managua, 400 m, 18 Dec 1940-9 Feb 1941 (AAH, F).

This variety is primarily found within the Sierras de Managua, a low elevation, small volcanic mountain range near the Pacific Ocean. Although it seems most closely associated morphologically and geographically with var.

hondurensis, it differs in having glabrous to slightly hispidulous leaves, which are much longer and broader than those of var. *hondurensis*, and smaller capitula, with fewer, shorter ray florets. Unfortunately, no flavonoid data or chromosome counts are available from this variety.

Bidens izabalensis Roseman, *sp. nov.* TYPE: GUATEMALA. Izabal: abundant, climbing along roadside over shrubs and grass, 1 mi SW of road to Mariscos from main highway to Puerto Barrios, 1 Jan 1980, Roseman 598 (HOLOTYPE: IA!; Isotypes: to be distributed).

B. squarrosae H.B.K. var. *speciosae* Roseman similis sed differt foliis plerumque simplicibus (vs. 3-5 partitis), ciliis longis ad basim involucri, et pedunculis longioribus (41-48 mm vs. 35-39 mm). Differt a *B. squarrosae* vars. *indivisae* (B.L. Robins.) Roseman et *hondurensi* Roseman foliis crassis coriaceisque et capitulis majoribus (plus quam 33 mm vs. minus quam 26 mm latis).

Stems scandent, robust, often rooting at the nodes, glabrous or densely tomentose; leaves coriaceous, usually simple, sometimes 3 parted, (9.6)11.3-15.7(18.3) cm long, 3.0-11.8 cm wide, petioles (1.2)1.9-4.5(6.2) cm long, leaves or leaflets ovate lanceolate to triangular, acuminate, margins sharply serrate, usually glabrous but rarely densely puberulent on both surfaces; heads few, in large, open cymose inflorescences, peduncles 3.1-5.8(7.0) cm long, capitula (2.5)2.7-3.4(3.5) cm wide; involucre basally strigose or rarely tomentose. outer involucral bracts (4)6-8(10), (3.0)4.0-6.8(9.0) mm long, 1.0-1.6(2.0) mm wide, linear to linear spatulate, acute, ciliate, glabrous (tomentose); inner involucral bracts 8-12, (5.0)5.6-7.8(8.5) mm long, (1.2)1.5-1.9(2.0) mm wide, glabrous to sparsely strigose on outer surface, yellow tomentose apically; ray florets 3-7(9), ligule narrowly elliptic, acuminate to slightly mucronate, (12.5)13.7-19.1(22.0) mm long, 3.7-5.5(6.0) mm wide, 7-9 striate; disc florets (18)26-38, 5-6 mm long; anther tubes 2.8-3.5 mm long, dark brown; achenes 7.0-9.5(10.0) long, awns 2, straight, (2)3(4) mm long, 2-6 retrorse and 0-1 antrorse barbs; chromosome number $n=36$.

REPRESENTATIVE SPECIMENS: BELIZE: *Funk 2601*, Cayo, 26.6 mi W of Belize on Hwy to Roaring Creek, 1 Dec 1977 (TEX); *Crane 162*, Corozal district, Cerros Maya Ruins, Lowry's Bight, coastal area, 18 Mar 1981 (LL); *Gentle 949*, Maskall, 9 Dec 1933 (F, MICH, NY).

GUATEMALA. Alta Verapaz: *Tuerckheim 1475*, Cobán, 1350 m, Nov 1906 (F, MICH, MO); *Johnson 921*, Samac, "Tsulah-karn," 4500 ft, 20 Nov 1920 (US). Baja Verapaz: *Hawkes, Hjerting & Lester 1930*, summit of road, damp forest, clearings, 16 mi from Salamá on road to Cobán, Patal, 1700 m, 11 Nov 1958 (F). Izabal: *Roseman 598*, 1 mi SW turn off to Mariscos from Hwy to Puerto Barrios, 1 Jan 1980 (IA); *Steyermark 38518*, jungle thickets, between Milla 49.5 and ridge 6 mi from Izabal, Montaña del Mico, alt. 65-600

m. 1 Apr 1940 (F). Petén: *Aquilar 231*. La Libertad and vicinity, 29 Nov 1934 (AAH. MICH. MO, NY, US); *Contreras 3646*, Vaxactun, Bajo El Brinco. in tinal on Dos Lagunas Rd., ca. 4 mi N, 23 Dec 1963 (LL). Zacapa: *Roseman 595*, scrambling over muddy bank. rooting at the nodes. near Juan de Paz. 4 mi from Zacapa-Izabal boundary line, 1 Jan 1980 (IA).

MÉXICO. Chiapas: *Breedlove & Davidse 55236*, 70 km SW of Palenque on rd to Ocosingo along the Jol Uk'um, 550 m, 9 Nov 1981 (TEX).

This species differs from *Bidens squarrosa* varieties *indivisa* and *hondurensis*, which also have simple leaves, by the thick, coriaceous leaf texture and larger heads (greater than 33 mm across vs. less than 26 mm).

Bidens izabalensis occurs mainly in the Atlantic drainage slopes of Guatemala. Most plants are robust vines, with especially long internodes, thick stems, and thick, coriaceous, primarily simple leaves. Specific morphological features which characterize *B. izabalensis* and help to distinguish it from the ubiquitous *B. squarrosa* and *B. antiquensis* populations are: 1) heads 30.6 ± 0.9 mm wide at anthesis, 2) peduncles 44.5 ± 3.4 mm long, 3) base of the involucre with long cilia, 4) outer involucral bracts 5.5 ± 0.4 mm long and 1.3 ± 0.1 mm wide.

Bidens boquetiensis Roseman, *sp. nov.* TYPE: PANAMÁ. Boquete: climbing 20 ft. into trees near coffee finca. 23 mi from church in Boquete, on road to Altos de Boquete, 6 Dec 1979, *Roseman 556* (HOLOTYPE: IA!; Isotypes: to be distributed).

B. holwayi Sherff & S.F. Blake similis sed differt involucri bracteis exterioribus longioribus (8.9-9.9 mm vs. 7.1-7.5 mm longis) et floribus disci longioribus (7.8-8.2 mm vs. 6.3-6.5 mm longis). Differt a *B. squarrosae* H.B.K. var. *squarrosae* floribus radii longioribus (2.1-2.7 cm vs. 9.4-14.7 cm longis) et pedunculis longioribus (5.0-7.8 cm vs. 2.3-4.0 cm longis).

Stems scandent, robust, glabrous to moderately tomentose; leaves simple or 3 to 5 parted, 11.9-14.9(19.2) cm long, 4.8-10.6(16.4) cm wide, leaf segments 1.8-4.3(4.8) cm wide, petioles 1.9-3.7(4.3) cm long, leaflets lanceolate or ovate lanceolate, acuminate, margins sharply serrate, glabrous to hispidulous on upper surface, hispidulous to densely tomentose on lower surface; heads few, in terminal and lateral open cymose inflorescences, peduncles (3.0)5.0-7.8(9.3) cm long, capitula (3.5)4.2-5.2(6.0) cm wide; involucre basally strigose to densely long tomentose; outer involucral bracts 8-10(12), these (5.0)5.9-8.7(9.0) mm long, (0.8)1.0-1.6(2.2) mm wide, linear spatulate, acute, with swollen bases, ciliate, glabrous to densely pubescent on both surfaces; inner involucral bracts (6)7-11(13), these 6.5-8.1(9.0) mm long, 1.4-2.2(3.0) mm wide, with swollen bases, densely yellow tomentose apically, glabrous to moderately hispidulous;

ray florets 5-7, ligules narrowly elliptic, acute to acuminate, slightly mucronate to denticulate, 2.1-2.7 cm long, 6.1-9.0 cm wide, 9-13 striate, sometimes with interrupted or branched striations; disc florets 12-28, the corollas 5.8-7.0 mm long; anther tubes 3.5-4.5 mm long, black; achenes linear, dark brown to black, glabrous, ciliate on margins and summit, 9.5-13.6(16.0) mm long, the awns 2, reflexed, 4.3-5.7(6.0) mm long, with 3-6(8) retrorse and 0-1 antrorse barbs per angle of awn; chromosome number, $n=48$ or, very rarely, $n=72$ or $n=36$.

REPRESENTATIVE SPECIMENS: COSTA RICA. Alajuela: *Standley & Torres R. 47910*, Viento Fresco, 1600-1900 m, 13 Feb 1926 (US). Cartago: *Holway 453*, Volcán de Irazú, 1500 m, 21 Jan 1916 (GH); *King 5398*, 16 kms S of Cartago, 24 Aug 1962 (TEX). Heredia: *Jimenez 2510*, San Rafael de Heredia, 1570 m, 12 Nov 1964 (F); *Roseman 563*, Vara Blanca, 16 Dec 1979 (IA). Puntarenas: *Pounds 98*, Monteverde Cloud Forest Reserve, 1500-1600 m, 14 Oct 1983 (TEX); *Roseman 567*, 1.5 mi N of cheese factory, Monteverde, 1450 m, 20 Dec 1979 (IA).

PANAMÁ. Chiriquí: *Allen 1342*, vicinity of "New Switzerland," central valley of Río Chiriquí Viejo, 1800-2000 m, 6-14 Jan 1939 (F, GH, MO NY, US); *Davidson 151*, Bajo Chorro. Boquete. 6000 ft, 18 Jan 1938 (F, GH, MO US); *Davidson 1004*, Volcán de Chiriquí, Boquete district, 9500 ft, 16 Jul 1938 (F); *Roseman 555*, 3.3 mi N of Boquete near bridge, 3300-4200 ft, 5 Dec 1979 (IA); *Roseman 559*, ca. 5 mi NW of Volcán, on road to Río Serreno, 8 Dec 1979 (IA).

Populations of *Bidens boquetiensis* are found in the cloud forest of many high elevation sites in Costa Rica and Panamá. These primarily octoploid populations are vigorous and robust, climbing as high as 20-30 m into forest trees and then hanging downwards. They have extremely large, showy heads and large simple or 3-5 parted leaves. They may be distinguished from the hexaploid *B. squarrosa* var. *squarrosa* populations of the same geographic areas by their much larger heads (4.2-5.2 cm across vs. 1.2-2.8 cm), longer peduncles (5.0-7.8 cm vs. 2.3-4.0 cm), and longer rays (21-27 mm vs. 9.9-14.7 mm). The only other closely related taxon with extremely large heads is *B. holwayi* Sherff & S.F. Blake of Guatemala and México. *Bidens holwayi* is also an octoploid taxon ($n=48$), but has a quite different flavonoid chemistry. It can be distinguished morphologically from *B. boquetiensis* by its longer outer involucre bracts (9.4 ± 0.5 vs. 7.3 ± 0.2), longer inner involucre bracts (9.8 ± 0.4 vs. 7.3 ± 0.1), and longer disc corollas (8.0 ± 0.2 mm vs. 6.4 ± 0.1).

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